

# The Effect of Employer Matching and Defaults on Workers' TSP Savings Behavior

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# The Literature and Our Contributions

The effects of an employer match, automatic enrollment, and other defaults on employees' savings behavior have been studied extensively. However, most of the previous literature has examined such changes in defined contribution (DC) plans in the private sector—an approach that makes extrapolating findings to public-sector workers difficult.

Moreover, current empirical approaches are ill suited for forecasting the combined effect of changing matching and default rates on savings behavior because few studies develop models that predict the distribution of employees' contribution rates.

## The Literature and Our Contributions (Continued)

This study uses two sources of exogenous variation stemming from policy changes to the retirement benefits of federal workers to estimate the effects of matching and defaults on their savings behavior.

We estimate the effect of introducing an employer match and the effect of instituting automatic enrollment on workers' participation, contributions, and portfolio allocations. We use a treatment-control framework on adjacent cohorts of recently hired workers.

We develop an empirical framework to model the distribution of contribution rates. Specifications motivated by psychological anchoring fit the data better than ones rooted in neoclassical theory.

Our results indicate that most of the estimates from the literature substantially understate the effect of matching. Using estimates from our empirical model, we trace the effects on federal workers' contributions and employers' costs that would result from changes to the DC plan that have not yet been implemented.



# Data on Federal Employees

We use administrative data about almost all civilian federal employees. The data span the period from 2008 through 2014 and include the following:<sup>1</sup>

- The amount that the employees contribute, their balance in each asset, default contribution rates, eligibility for matching contributions, and other information on their activity with the Thrift Savings Plan (TSP); and
- Extensive information on the employees' characteristics and compensation, including the day they were hired and detailed information about their scheduled salaries.

1. Those data are provided by the Office of Personnel Management (from its Enterprise Human Resources Integration Data Warehouse Statistical Data Mart) and by the Federal Retirement Thrift Investment Board.

# Changes to Federal Employees' Retirement Benefits

The data cover two substantial changes in policy.

- An overhaul of retirement benefits:
  - Workers hired before 1984 are generally in the Civil Service Retirement System (CSRS), which provides a defined benefit (DB) pension but no employer contributions to TSP.
  - Workers hired in later years are in the Federal Employees Retirement System (FERS), which incorporates Social Security and provides a DB pension and matching contribution to TSP (a 100 percent match on the first 3 percent that the employees contribute and a 50 percent match on the next 2 percent).
  
- The implementation of automatic enrollment (AE) with a default contribution rate of 3 percent for workers hired after August 2010. (The default allocation for contributions is the G Fund. The interest rate for that fund is based on the yield for Treasury notes.)

# Behavior and Traits of Adjacent Cohorts With and Without an Employer Match

	No Match <i>(Hired in 1983)</i>	Match <i>(Hired in 1984)</i>
<b>TSP Behavior</b>		
Percentage of workers who contribute	69.5	91.7
Average contribution rate (As a percentage of salary)	5.9	9.2
Average contribution rate for those who contributed (As a percentage of salary)	8.5	10.0
Percentage of workers whose whole portfolio is invested in the G Fund	16.7	24.1
Percentage of workers' portfolio invested in the G Fund	45.5	53.1
Average ratio of balance to pay	0.8	2.5
<b>Sample Size</b>	90,533	133,015

# Behavior and Traits of Adjacent Cohorts With and Without an Employer Match (Continued)

	No Match <i>(Hired in 1983)</i>	Match <i>(Hired in 1984)</i>
<b>Demographics</b>		
Average age	55.5	54.6
Female (Percent)	43.7	47.8
White (Percent)	76.8	73.6
Black (Percent)	16.7	19.6
Hispanic (Percent)	6.5	6.8
High school or less (Percent)	26.4	27.1
Some college (Percent)	24.7	24.3
College (Percent)	32.4	31.8
Graduate school (Percent)	16.5	16.9
Average annual earnings (2014 dollars)	97,100	94,600
<b>Sample Size</b>	90,533	133,015



# Behavior and Traits of Adjacent Cohorts Hired Before and After Automatic Enrollment and Observed Zero to Four Months After Hire

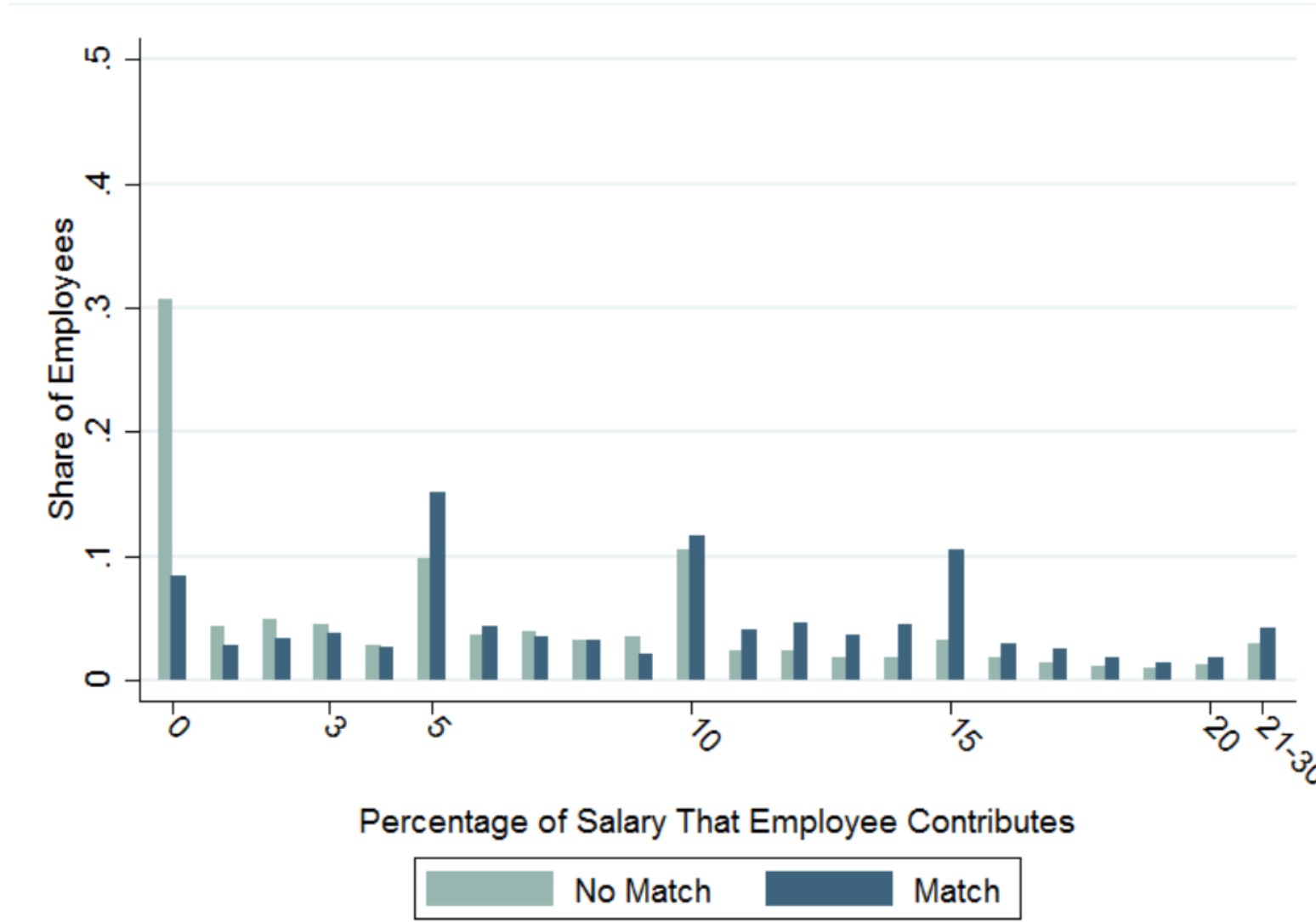
	Hired Before AE <i>(Hired between August 2009 and July 2010)</i>	Hired After AE <i>(Hired between August 2010 and July 2011)</i>
<b>TSP Behavior</b>		
Percentage of workers who contribute	60.0	96.7
Average contribution rate (As a percentage of salary)	2.9	4.4
Average contribution rate for those who contributed (As a percentage of salary)	4.8	4.5
Percentage of workers whose whole portfolio is invested in the G Fund	76.0	79.7
Percentage of workers' portfolio invested in the G Fund	84.3	85.5
Average ratio of balance to pay	0.2	0.2
<b>Sample Size</b>	51,732	53,386



# Behavior and Traits of Adjacent Cohorts Hired Before and After Automatic Enrollment and Observed Zero to Four Months After Hire (Continued)

	Hired Before AE <i>(Hired between August 2009 and July 2010)</i>	Hired After AE <i>(Hired between August 2010 and July 2011)</i>
<b>Demographics</b>		
Average age	38.9	38.9
Female (Percent)	42.3	42.9
White (Percent)	77.9	77.7
Black (Percent)	16.9	17.2
Hispanic (Percent)	5.2	5.1
High school or less (Percent)	29.7	30.0
Some college (Percent)	15.6	16.3
College (Percent)	29.4	27.4
Graduate school (Percent)	25.3	26.3
Average annual earnings (2014 dollars)	65,400	65,100
<b>Sample Size</b>	<b>51,732</b>	<b>53,386</b>

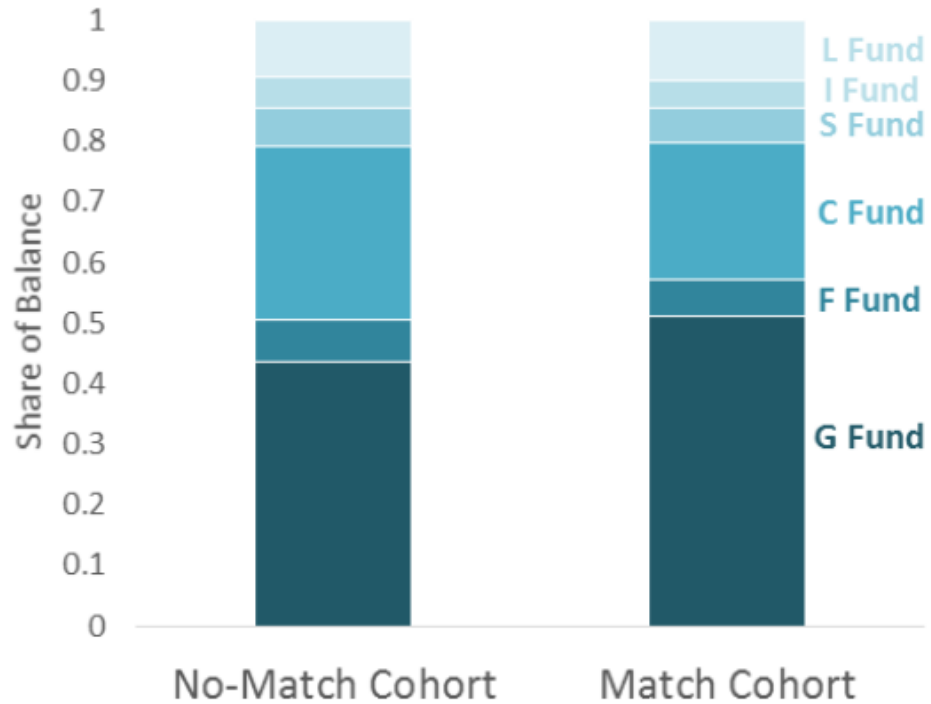
# Distribution of Employees' Contribution Rates for Employees With and Without an Employer Match (Adjacent Cohorts)



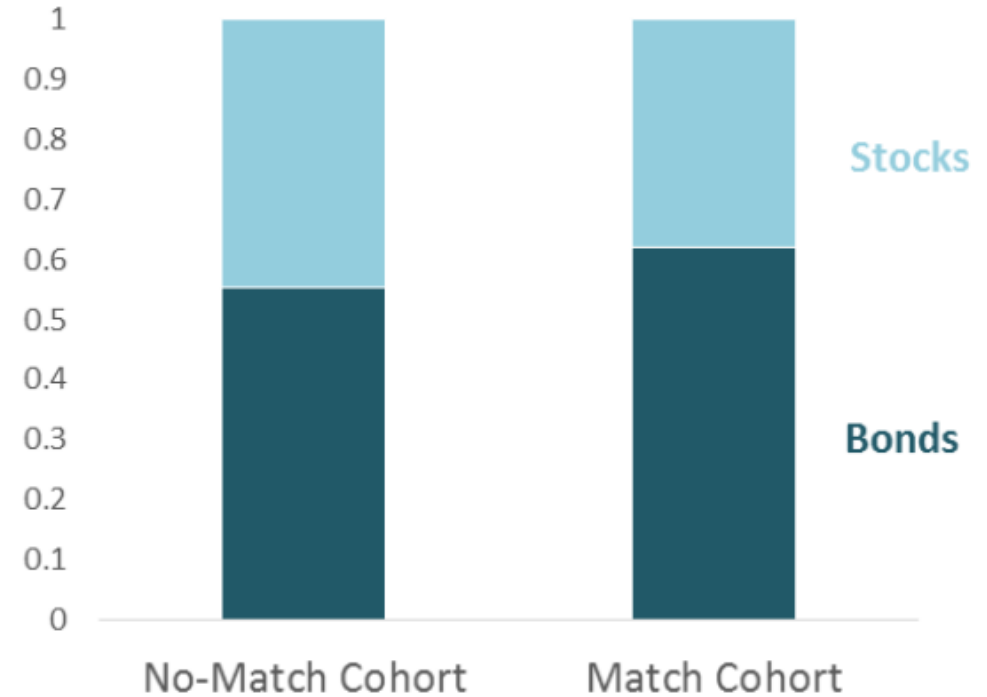


# Portfolio Allocations for Employees With and Without an Employer Match (Adjacent Cohorts)

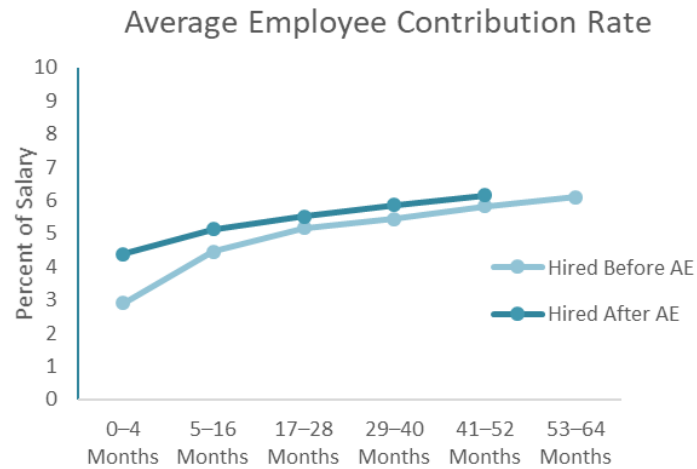
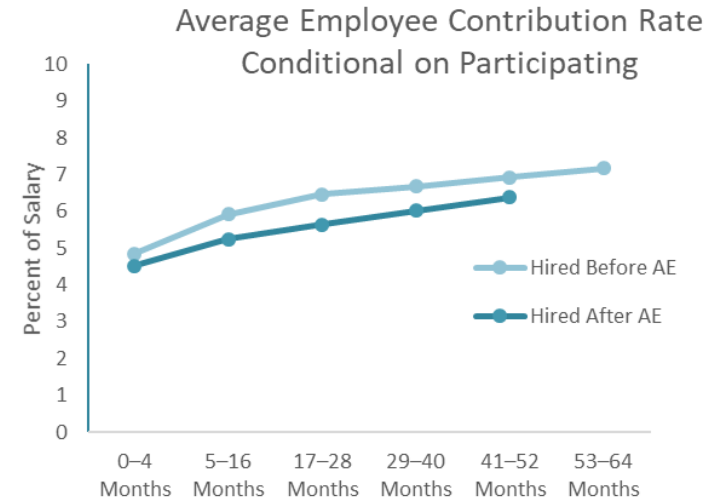
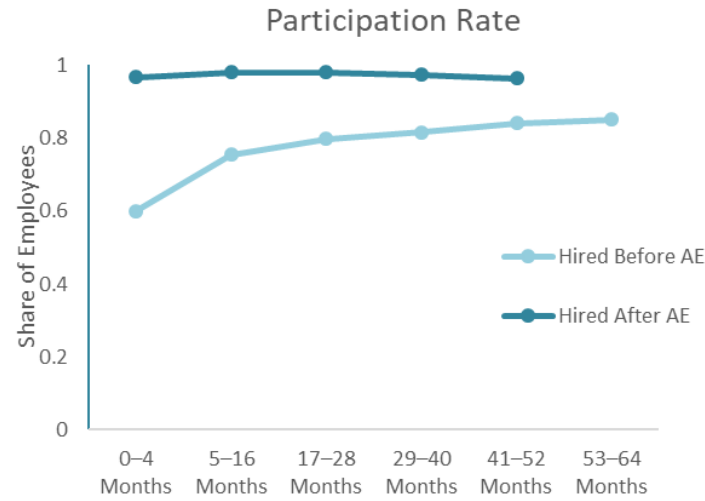
### Portfolio Allocation for Workers With Positive Balances



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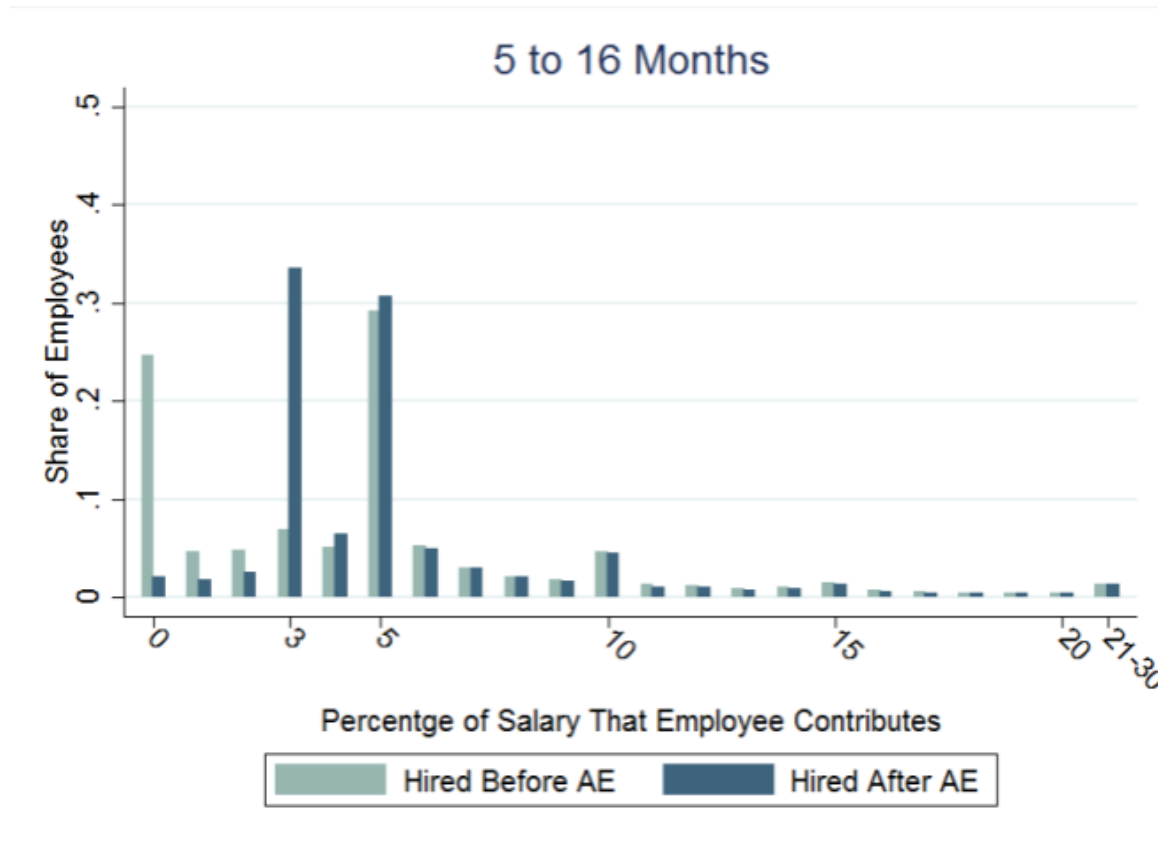


# Participation Rate and Average Contribution Rates for Employees Hired Before and After Automatic Enrollment (Adjacent Cohorts)

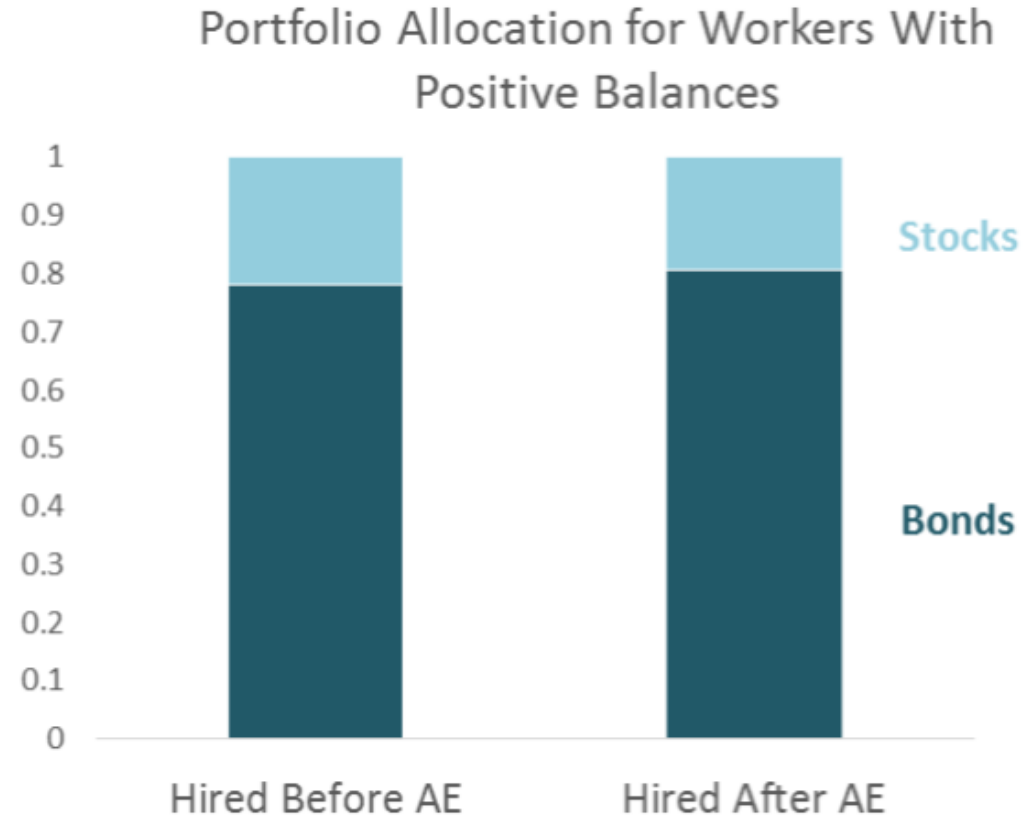
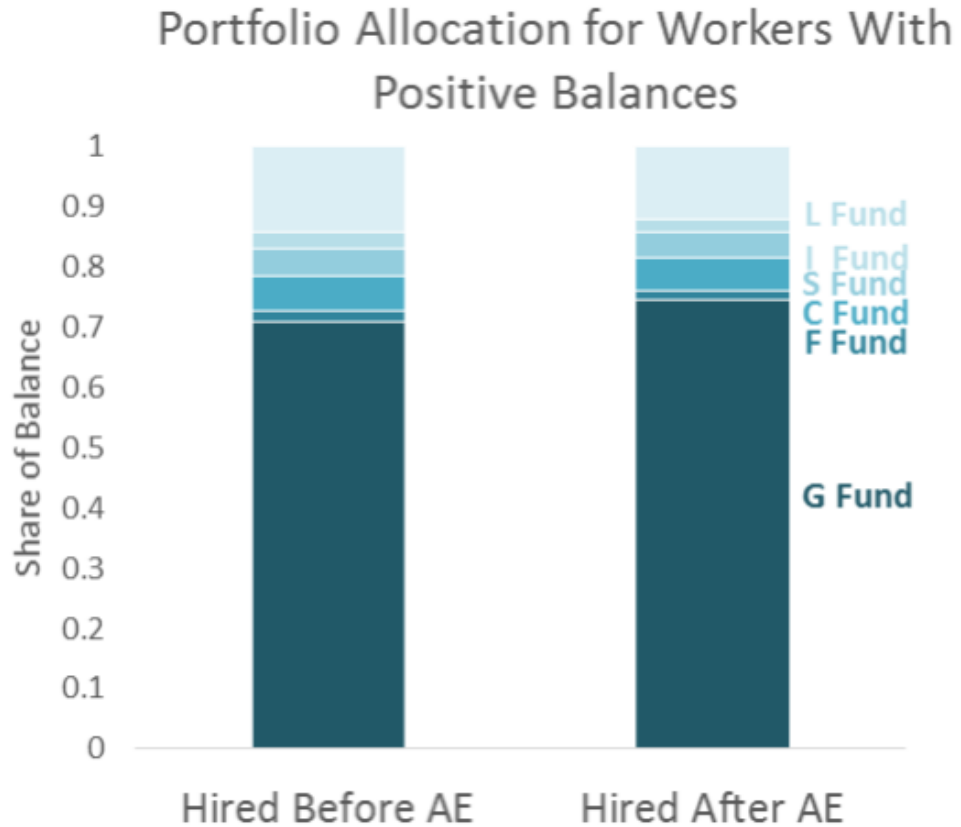




# Distribution of Employees' Contribution Rates for Employees Hired Before and After Automatic Enrollment (Adjacent Cohorts)



# Portfolio Allocations for Employees Hired Before and After Automatic Enrollment (Adjacent Cohorts)



# Treatment Effects Model

$$y_{it} = \alpha + \beta T_i + \gamma X_{it} + \varepsilon_{it}$$

where  $y_{it}$  is the outcome of interest,  $T_i$  is a dummy variable that indicates whether an individual belongs to a treated cohort, and  $X_{it}$  is a vector of observable worker characteristics.

# Treatment Effects Model: Results for the Employer Match

	Participation (OLS)	Employee Contribution Rate (OLS)	Balance-to- Pay Ratio (OLS)	Probability of Investing 100% in G Fund (OLS)	G Fund Share (OLS)	Bond Share (OLS)	Probability of Investing 100% in Bonds (OLS)	Probability of Investing 100% in Stocks (OLS)
<b>Match Cohort</b>	0.222***	3.480***	1.824***	0.020***	0.070***	0.068***	0.022***	-0.068***
Adjusted or pseudo- $R^2$	0.137	0.197	0.429	0.066	0.102	0.092	0.066	0.030
Number of observations	223,548	223,548	223,548	203,563	203,563	203,563	203,563	203,563



## Treatment Effects Model: Results for the Employer Match (Continued)

- Participation increases by 22 percentage points.
- The conditional contribution rate increases by 1.9 percentage points.
- The average contribution rate increases by 3.5 percentage points.
- The balance-to-pay ratio is twice as large 28 years later.
- The share of bonds in workers' portfolios increases by 7 percentage points.
- **Heterogeneous Effects.** Matching reduces intergroup variance of participation and contribution rates. However, because the bonds share increases most for those in the bottom tercile of earnings, those with low education, and nonwhites, the overall effect of matching is increased intergroup variance in TSP balance accumulations among all employees.

# Treatment Effects Model: Automatic Enrollment

	Nonparticipant (OLS)		<Default Rate (OLS)		Default Rate (OLS)		>Default Rate (OLS)	
Autoenrolled cohort	-0.185***		-0.038***		0.209***		0.015***	
<i>Effect over time</i>								
Autoenrolled cohort (First year)	-0.371***		-0.057***		0.317***		0.111***	
Autoenrolled cohort (Second year)	-0.232***		-0.053***		0.260***		0.025***	
Autoenrolled cohort (Third year)	-0.188***		-0.035***		0.225***		-0.001	
Autoenrolled cohort (Fourth year)	-0.163***		-0.030***		0.184***		0.009***	
Autoenrollment cohort (Fifth year)	-0.129***		-0.033***		0.150***		0.013***	
Adjusted $R^2$	0.103	0.108	0.023	0.023	0.115	0.118	0.093	0.093
Number of observations	1,010,838	1,010,838	1,010,838	1,010,838	1,010,838	1,010,838	1,010,838	1,010,838

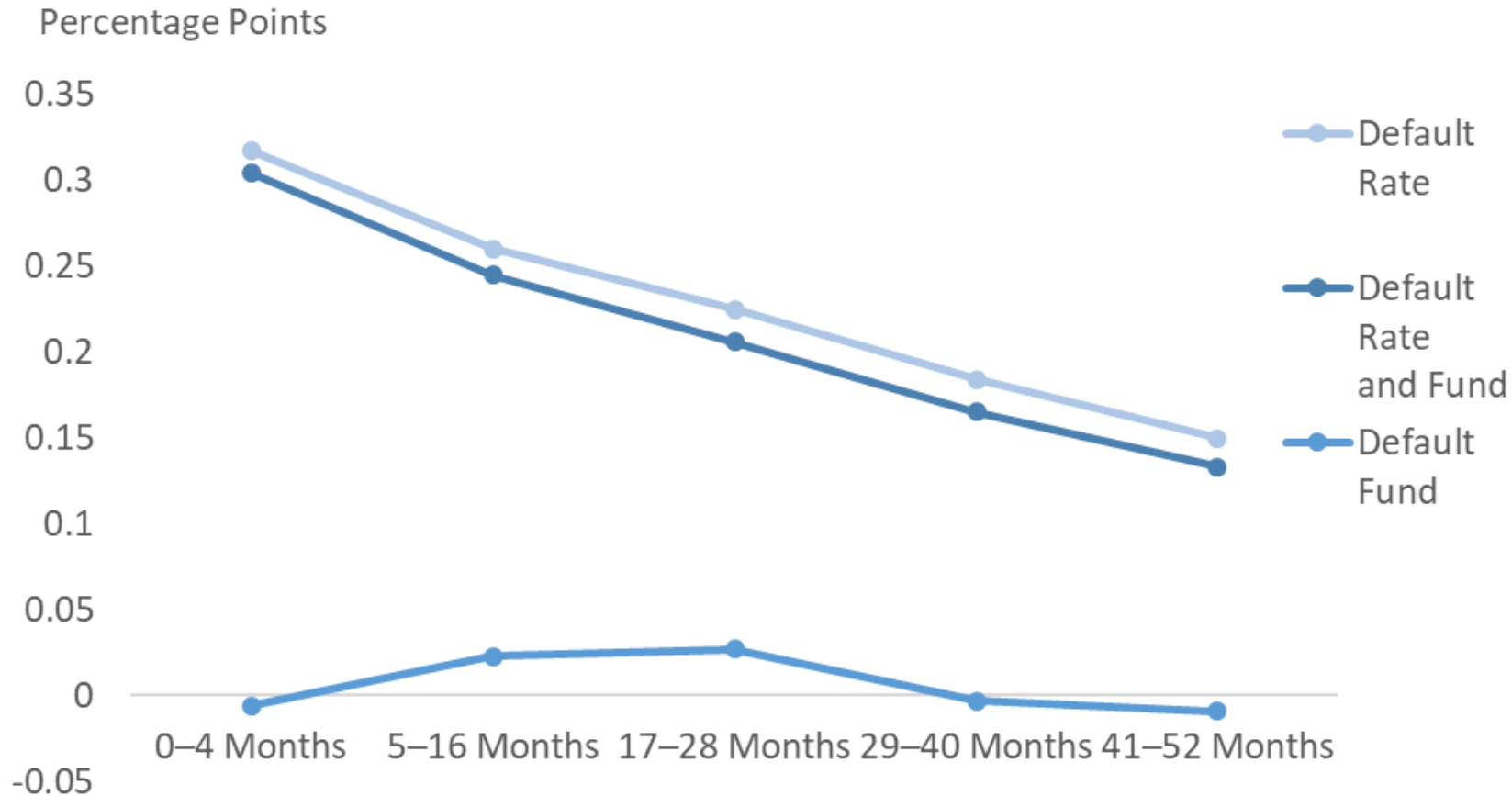
# Treatment Effects Model: Automatic Enrollment (Continued)

	Participation (OLS)		Contribution Rate (OLS)		Balance-to-Pay Ratio (OLS)	
Autoenrolled cohort	0.185***		0.630***		0.090***	
<i>Effect over time</i>						
Autoenrolled cohort (First year)	0.371***		1.606***		0.066***	
Autoenrolled cohort (Second year)	0.232***		0.825***		0.161***	
Autoenrolled cohort (Third year)	0.188***		0.528***		0.096***	
Autoenrolled cohort (Fourth year)	0.163***		0.551***		0.082***	
Autoenrolled cohort (Fifth year)	0.129***		0.478***		0.027***	
Adjusted or pseudo- $R^2$	0.103	0.108	0.128	0.129	0.072	0.073
Number of observations	1,010,838	1,010,838	1,010,838	1,010,838	1,010,838	1,010,838

# Treatment Effects Model: Automatic Enrollment (Continued)

	Probability of Investing			Probability of Investing		Probability of Investing				
	100% in G Fund (OLS)		G Fund Share (OLS)	100% in Bonds (OLS)		100% in Stocks (OLS)				
Autoenrolled cohort	0.008***		0.011***	0.003**		0.006***		0.004***		
<i>Effect over time</i>										
Autoenrolled cohort (First year)	-0.006**		0.002	0.002		-0.006**		0.002**		
Autoenrolled cohort (Second year)	0.022***		0.027***	0.019***		0.023***		-0.000		
Autoenrolled cohort (Third year)	0.025***		0.025***	0.018***		0.027***		-0.002***		
Autoenrolled cohort (Fourth year)	-0.004**		-0.002	-0.017***		-0.012***		0.011***		
Autoenrolled cohort (Fifth year)	-0.010***		-0.002	-0.008***		-0.012***		0.010***		
Adjusted $R^2$	0.134	0.134	0.139	0.139	0.132	0.132	0.131	0.131	0.016	0.016
Number of observations	1,001,970	1,001,970	1,001,970	1,001,970	1,001,970	1,001,970	1,001,970	1,001,970	1,001,970	1,001,970

# Treatment Effects Model: Automatic Enrollment (Continued)



Coefficient estimates:  
The effect of automatic enrollment on the probability of participating at the default rate, at the default fund, or at the default rate and fund

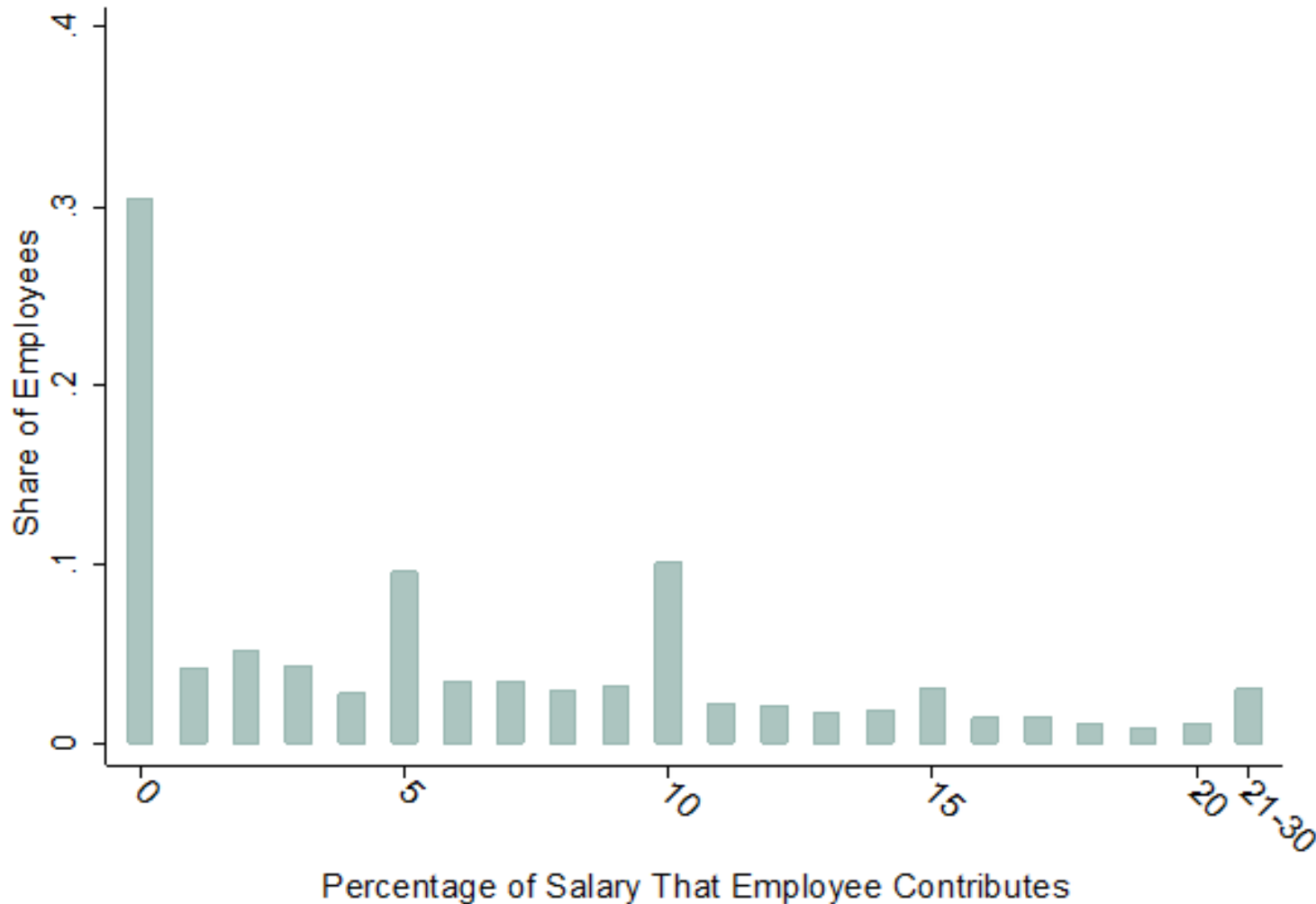
## Treatment Effects Model: Automatic Enrollment (Continued)

- Among workers hired under automatic enrollment, those who are more likely to be at the default rate and fund are:
  - Women,
  - Workers older than 30,
  - Black and Hispanic workers,
  - Less educated workers, and
  - Workers in the bottom tercile of the earnings distribution.

## Treatment Effects Model: Automatic Enrollment (Continued)

- Federal workers are more likely to move away from the defaults, and faster in doing so, than studies based on private-sector workers have reported.
  - Participation increased by 37 percentage points at zero to 4 months of tenure and by 13 percentage points at 41 to 52 months of tenure.
  - At 41 to 52 months of tenure:
    - The average contribution rate increased by 0.5 percentage points.
    - The balance-to-pay ratio increased by 2.3 percentage points.
    - The effect on portfolio allocations was negligible.
  
- Overall, the effect of automatic enrollment was strongest among the groups that have lower participation and contribution rates in its absence. The overall effect on TSP balance-to-pay ratios was equalizing among all workers.

# Challenges in Modeling the Distribution of Employees' Contribution Rates



Even in the absence of a match or automatic enrollment, a flexible approach is needed to explain common features of the distribution, such as the spikes at multiples of 5.



# Discrete Choice Model for the Distribution of Employees' Contribution Rates

We use a hazard model to describe the behavior of most workers:

$$\Pr(k_{i,t} = k_{i,t}^{obs} \mid k_{i,t} \leq k_{i,t}^{obs}, k_{i,t} < k_{i,t}^{max}) =$$

$$\Pr(\tau_k + \text{matching } fx_{i,t,k} + \text{default } fx_{i,t,k} + X_{i,t,k}\gamma_{i,t,k} > \varepsilon \mid k_{i,t} \leq k_{i,t}^{obs}, k_{i,t} < k_{i,t}^{max})$$

We consider two specifications of *matching effects* and *default effects*. They are motivated by different models of workers' behavior:

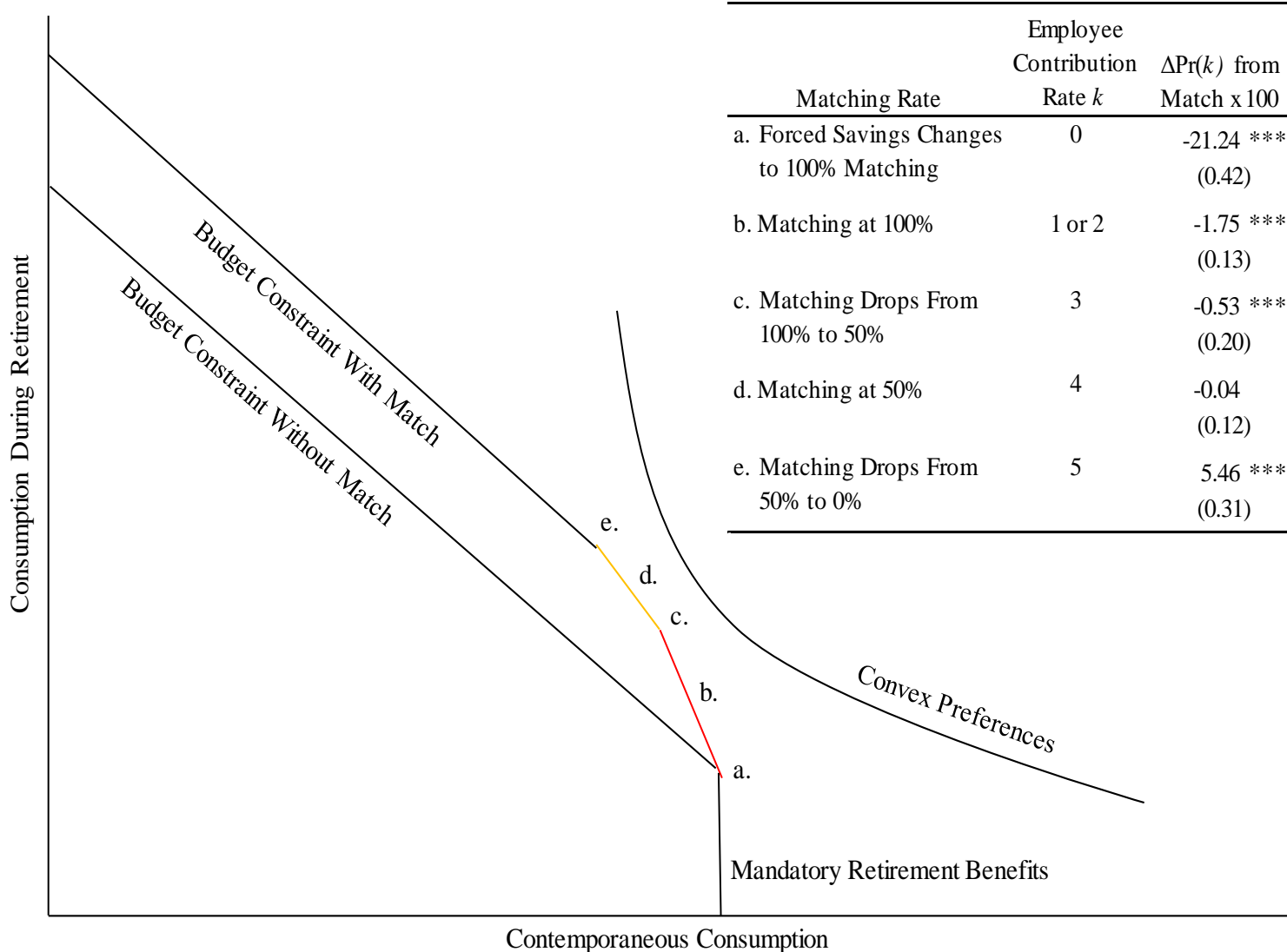
- Neoclassical models and
- Models of psychological anchoring and inattentiveness.

# Intertemporal Substitution

All four tests that we run indicate that intertemporal substitution is not prevalent.

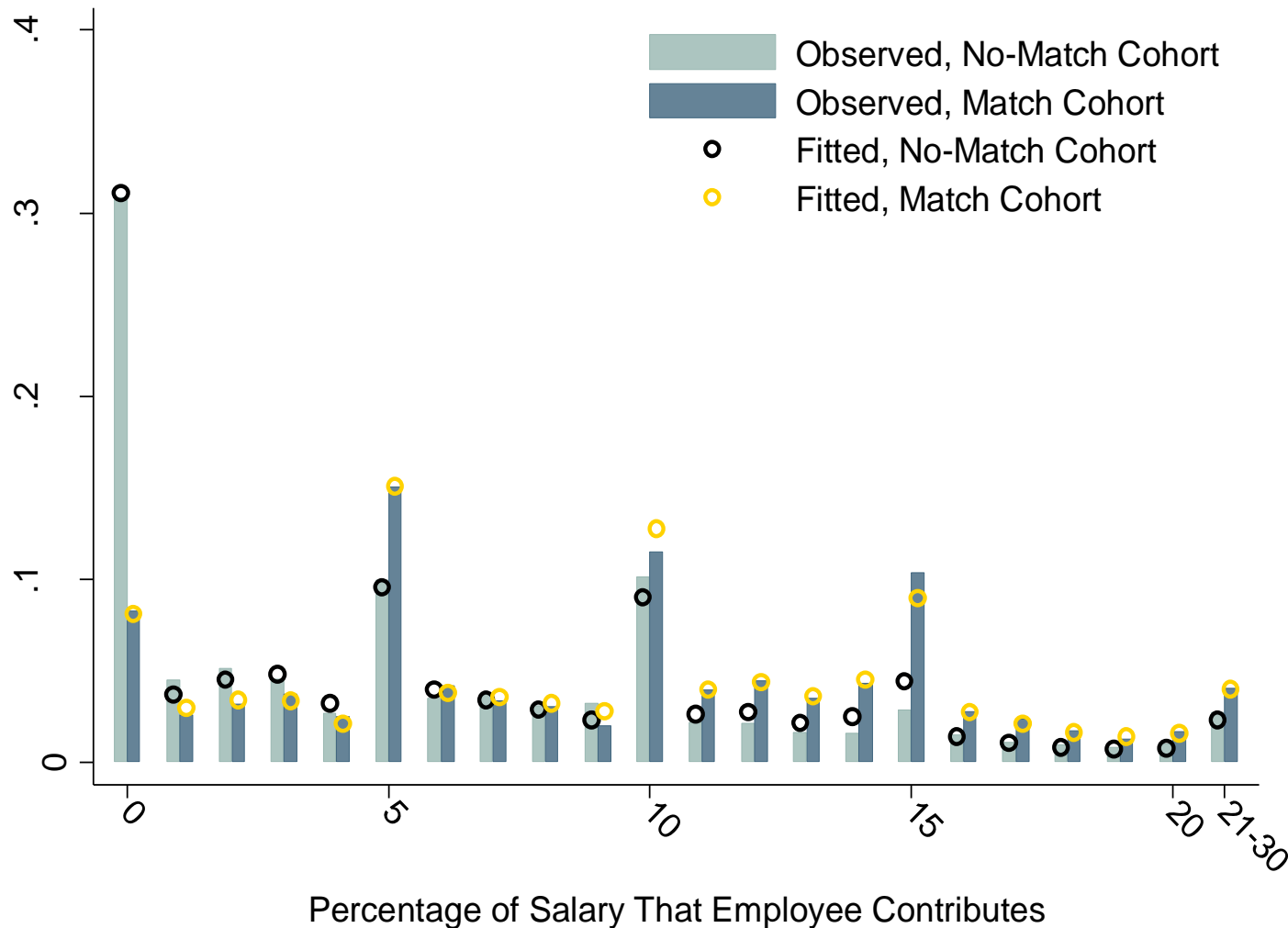
- The shift from CSRS to FERS increases DB pension wealth for most workers, but workers in FERS choose to contribute more to the TSP.
- The DB pensions provided through FERS are more progressive, but lower-income workers in FERS contribute nearly double the amount that lower-income workers in CSRS do.
- An increase in the amount that employees must contribute to their DB pensions had little effect on TSP contributions.
- The reduction in payroll taxes had little effect on TSP contributions.

# The Relationship Between Employees' Contributions and the Price of Savings



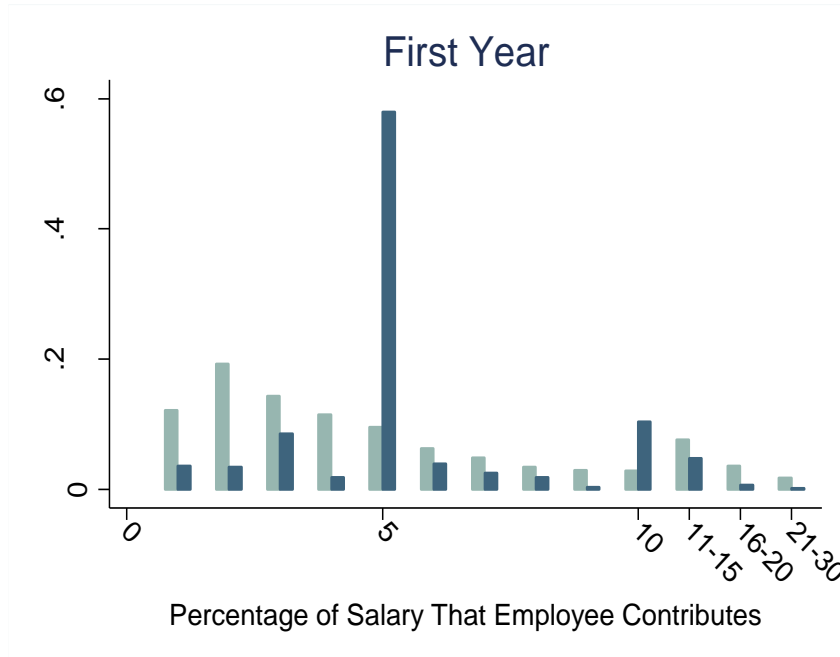
The data adhere to some predictions of the neoclassical model, but workers are less likely to contribute at the kink where the matching rate falls from 100 percent to 50 percent.

# Fit of Anchoring Specification for the Effect of the Match on Employee Contribution Rates



A specification motivated by psychological anchoring fits the data well. That specification allows the matching threshold to serve as a focal point that workers are drawn toward.

# Further Test of Whether the Matching Threshold Serves as an Anchor



■ Set Dollars Per Pay Period    ■ Set Percentage of Salary

Because the matching threshold is specified as a percentage, workers who make their election in dollars might ignore it. The data indicate that those workers are not anchored to the matching threshold and are more likely to make large contributions.

# Average Effects of Adding the Employer Match, by Specification

Change in Percentage Points	Observed Difference Between Cohorts	Fitted Differences	
		Neoclassical	Anchoring
Employees' Contributions	3.29 *** (0.03)	0.20 *** (0.02)	3.32 *** (0.05)
Matching Contributions	3.44 *** (0.00)	3.05 *** (0.00)	3.48 *** (0.01)

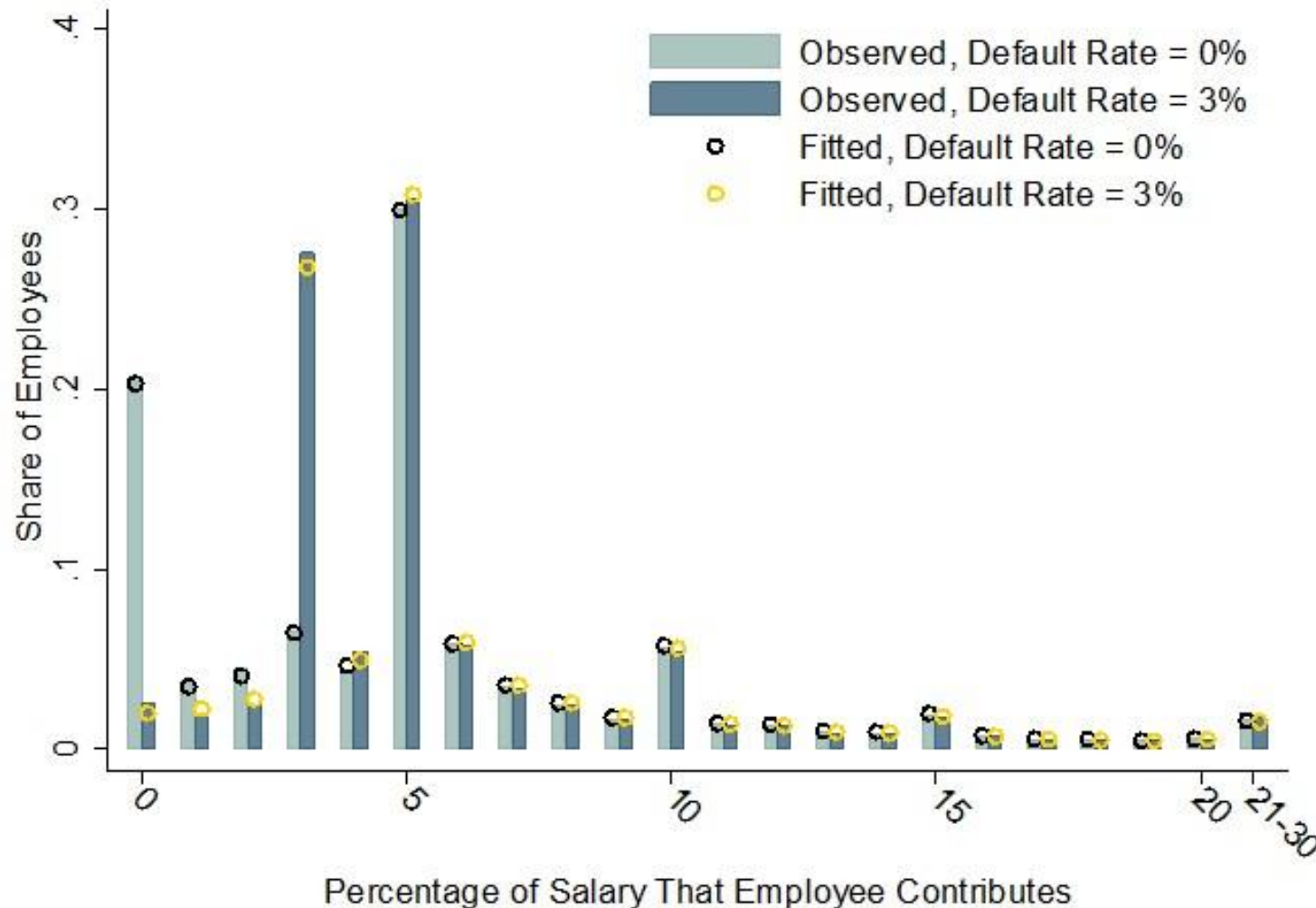
# The Default Contribution Rate in Neoclassical Models

We examine whether the mass points at the default contribution rates are consistent with neoclassical models by calculating the transaction cost necessary to create such a mass.

Both measures that we consider indicate that the transaction costs necessary to reconcile the mass at the default rate with a neoclassical model are implausibly large.

- In a rudimentary model, the cost of not electing a rate when the default rate is zero is about \$2,600 in forgone matching, on average.
- The lack of a mass at the rate at which matching falls from 100 percent to 50 percent indicates that the benefits of contributing are large; thus the cost must be large as well.

# Fit of Anchoring Specification for the Effect of the Default Rate on the Distribution of Employees' Contribution Rates



Anchoring can explain workers' contributing at the default rate of 3 percent instead of at 1 percent or 2 percent.

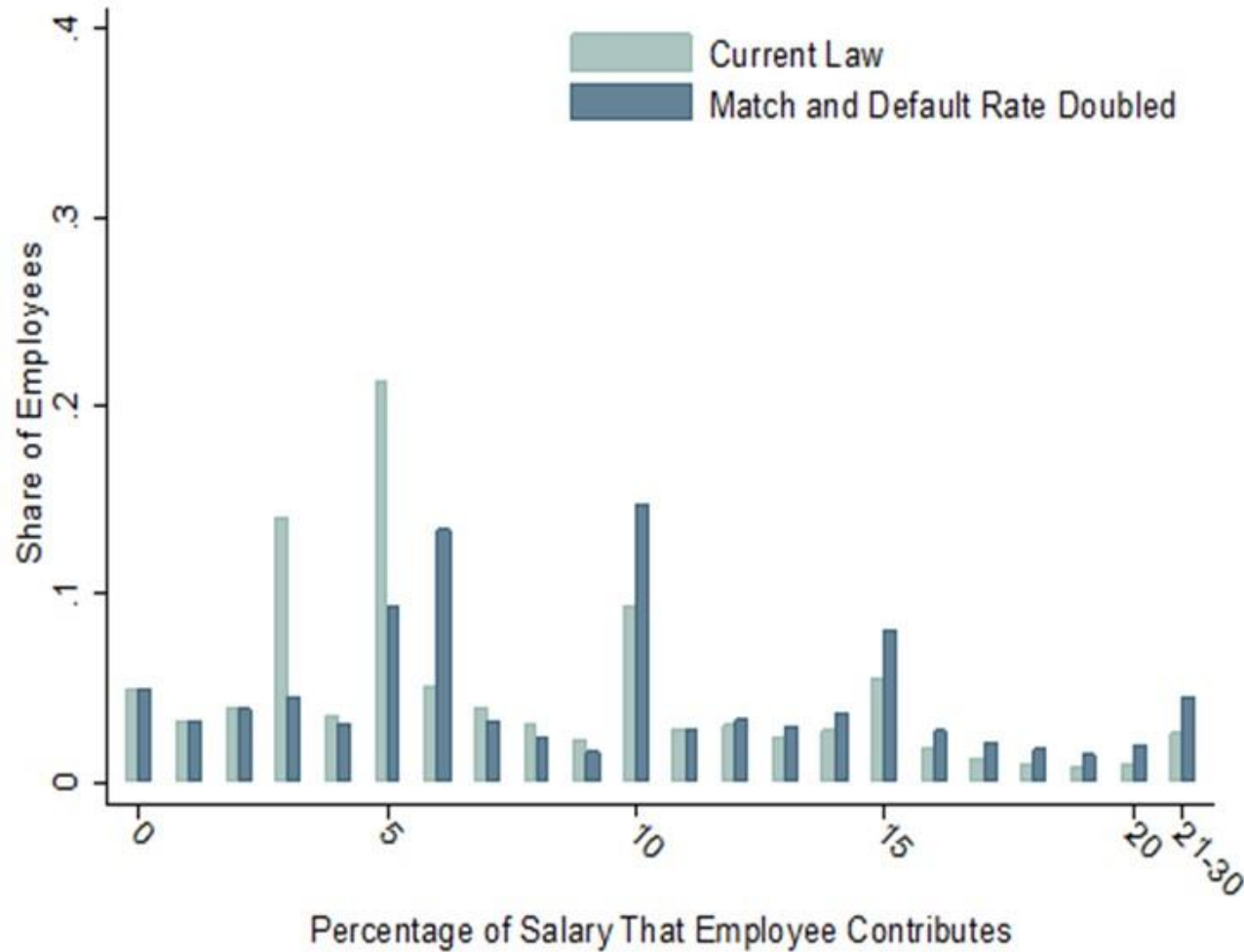


# Average Effects of Increasing the Default Contribution Rate, by Sample

Change in Percentage Points	Workers Hired	
	Within 1 Year of the Increase	Extrapolation to All Cohorts
Employees' Contributions	0.53 *** (0.02)	0.29 *** (0.01)
Matching Contributions	0.59 *** (0.01)	0.29 *** (0.01)

Expanding the analysis from recent hires to all employees substantially reduces the effect of the default rate.

# Simulated Distributions of Employees' Contribution Rates, by Match and Default Contribution Rate



We use the model to forecast the effects of policies that would replace the FERS DB pension with additional contributions from employers and a higher default rate.

Specifically, matching increases from (a) 100 percent on the first 3 percent that employees contribute and 50 percent on the next 2 percent to (b) 100 percent on the first 6 percent and 50 percent on the next 4 percent. The default rate for employees' contributions is increased from 3 percent to 6 percent.



# Simulated Average Effects of Simultaneously Doubling Matching and the Default Contribution Rate

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Change in Percentage Points	Total Effect		
	Effect of Match	Effect of Default Rate	(Includes Interactions)
Employees' Contributions	1.38	0.39	1.78
Matching Contributions	2.35	0.10	2.69

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# Conclusion

We use administrative data about federal workers' compensation and TSP behavior and exogenous variation from two policy changes to estimate that:

- Participation increased by 22 percentage points after introducing an employer match and by 13 percentage points after instituting automatic enrollment.
- Average employee contribution rates to the TSP increased by 3.5 percentage points and 0.6 percentage points after the two policy changes, respectively.
- The reforms had a small effect on portfolio allocations in the case of employer matching and negligible effect in the case of automatic enrollment.
- There is considerable heterogeneity in the effects of the two policies.
- The overall effect of automatic enrollment on TSP balance accumulations is equalizing across workers, whereas that of employer matching is not.

## Conclusion (Continued)

- When modeling the distribution of contribution rates, we find that psychological anchoring explains workers' behavior better than neoclassical theory.
- We predict that a policy that doubles the match and the default rate would increase both employee and matching contributions, with the higher matching rates causing most of those increases.